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## RATIONING MEDICAL CARE: AN ECONOMIST'S PERSPECTIVE

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**Abstract**

In this essay, prepared for a symposium in <u>Economics and Philosophy</u>, I identify some issues that arise in trying to bring the kind of economics I normally practice to this subject. I proceed by examining the parallels and differences between allocating medical care and several other allocation problems, starting with the distribution of income generally and then in the more specific context of retirement income. I distinguish two types of questions. The <u>evaluation</u> question is the examination of a given allocation in order to assess its "quality" in either absolute terms or relative to some other allocation. The <u>decision</u> question is the use of an evaluation system and a description of a mechanism allocating medical care (and other resources) in order to decide whether changing the allocation mechanism in some way is an improvement. Discussion of the allocation mechanism leads to a focus on equilibrium, that is, a focus on the outcomes that happen given the design of the mechanism. Consideration of equilibrium leads to the argument that one needs to consider who pays for medical services along with who gets them, since an equilibrium is inadequately specified without identifying the sources of resources as well as their uses.

Rationing Medical Care - An Economist's Perspective[1]

Peter Diamond

     Rationing medical care is both inevitable and unpleasant.
Different disciplines bring different elements to a discussion of
how to ration.  In this essay, I identify some issues that arise in
trying to bring the kind of economics I normally practice to this
subject, particularly issues involving the relationship between
economics and philosophy.  Recognizing analogies as a fruitful
source of research ideas, I will proceed by examining the parallels
and differences between allocating (particularly limiting) medical
care and several other allocation problems, starting with the
distribution of income generally and then in the more specific
context of retirement income.  I will focus on the analogies, not
attempting to identify existing literature that already draws on
these parallels.

     By and large, economists are consequentialists.  The prime
concern of an economist with medical care is the outcome - the
amounts of medical care going to different people and the
amounts of other resources that different people give up in order
to provide the medical care.  There are a wide variety of
allocation mechanisms that could be employed to determine these
two allocations (the allocation of medical care and the allocation
of payments for medical care).  In practice societies use a mixture
of mechanisms.  Some of these involve direct payments by the
recipients of medical services, some of these do not.  I will use the
term rationing in this broad sense to mean the determination of
the provision of medical services, not in the narrow sense
restricted to decisions where little or no money passes hands.
While the focus will be on outcomes, I do not mean to deny the
existence of independent values attached to decision processes
themselves.

     I distinguish two types of questions.  The <u>evaluation</u> question
is the examination of a given allocation in order to assess its
"quality" in either absolute terms or relative to some other
allocation.  Evaluation discussions are often rich in context, while
being silent about a mechanism, if any, that might generate a
choice between two allocations.  The <u>decision</u> question is the use
of an evaluation system and a description of a mechanism

allocating medical care (and other resources) in order to decide whether changing the allocation mechanism in some way is an improvement.  Because one is trying both to predict the implications of a mechanism change and to evaluate those implications, the limitations of our analytical ability tend to result in a less rich context than when doing evaluation.  Discussion of the allocation mechanism leads to a focus on equilibrium, that is, a focus on the outcomes that happen given the design of the mechanism.  Consideration of equilibrium leads to the argument that one needs to consider who pays for medical services along with who gets them, since an equilibrium is inadequately specified without identifying the sources of resources as well as their uses.

Some medical rationing problems come without much in the way of links to other resources.  For example, with a limited number of livers available for transplant, one can ask who should get them.  This type of decision is different from changing the regulation of the health insurance market which will both change the amount of medical care that people receive and the amounts that they pay for such care directly and indirectly, through taxes for example.  Yet, even in the liver case, there are likely to be implications for the allocation of other resources that should not be ignored, such as variation in the cost of doing transplants for different people.

We will consider different settings for rationing decisions. There is the determination of minimally guaranteed services, and the choice of coverage for publicly organized medical services (or publicly financed services).  There is an allocation of medical services when purchases of additional services are available, and when they are not.  Rationing arises in all of these contexts and probably requires different analyses in each.


I  Evaluating income distribution

Just as we care about evaluating the allocation of medical care to different people, we care about evaluating the allocation of income to different people.  I will take a quick tour through some of this literature and then return to medical care to look for parallels and differences.  Writings about income distribution draw on several literatures.  There is a sizable literature by both philosophers and economists on how to evaluate one or both of income determination outcomes and income determination processes.  The subtle literature on evaluating particular outcomes or processes typically focuses on the outcomes or processes, without simultaneous consideration of the constraints limiting what can be accomplished by government activities or other collective action.  When economists want to discuss government policies that affect income distribution, we simplify, we use a crisp mathematical formulation which will permit a tractable, potentially (hopefully) insightful, analysis of the use of economic policies.  For example, one can contrast the discussion by Rawls

(1971) of how to evaluate different income distributions (along with liberty) with the analysis by Phelps (1973) of implications for linear income taxation of trying to maximize the (Rawlsian) minimum level of after-tax-and-transfer income in the economy.

Thus, economists use the philosophical literature for ideas and justification in the process of selecting a simple characterization of the evaluation of outcomes. This simplification carries with it a restriction of applications - only when the results are thought to be robust to the simplifications employed does the analysis seem interesting. Thus economists are frequently "practical utilitarians" in the sense (Mirrlees, 1982) that optimization of a utilitarian objective function is taken to be a reasonable approximation to acceptable evaluations for a class of policies, policies that may not raise the kind of issues that utilitarianism has trouble grappling with. Thus the setting of income or excise tax rates is not so sensitive to the issues of "respecting individuals" that arise elsewhere. Similarly the assumption that preferences and cardinalization of those preferences are uniform across people makes more sense when considering income taxes than when considering, for example, disability insurance. In the latter case, the differences in income needs between the disabled and others is central to the analysis, a centrality lost in an assumption of uniformity in individual evaluations of income. By and large economists have focused on outcomes, not processes, and I will do the same for this essay.

In addition to being an essential step for practical analysis, formal mathematical statement of the social objective function is a method for examining implications of consistency in evaluations across different problems.

Turning from this general description to a concrete example, consider evaluating the quality of income distribution by a sum of individual utilities, with the same utility function employed for everyone: $S\{u(I_n)\}$, where $S\{\}$ is the summation operator, u is the social evaluation of income accruing, and $I_n$ is the income going to person n. That is for each person, indexed by n, we evaluate the income of that person for the aggregate or social objective function by using a utility function, u, and then adding up the different utilities attached to different people's incomes. Philosophical discussion can illuminate the appropriateness of using this linear symmetric objective function. Philosophical discussion can illuminate the appropriateness of choosing some particular utility function, u. Economic analysis can map alternative evaluation functions (e. g., nonlinear or more concave) into changed evaluations of different income distributions.

This approach can be used to answer, for example, the question of whether India does a better job of allocating the available income than the US does. One needs to adjust for the aggregate amount of income that is available to be allocated, for example by comparing the actual outcomes in each country with

what the outcome would be if everyone in the country had the same income. Doing such a calculation, one learns that the shape of the utility function u plays a critical part in the evaluation. Also one learns that the amount of variation in incomes among the very poor is very important as well as the numbers of (relatively) very poor. The comparison directs attention to evaluating such variation, with the choice of utility function being a way to hold the discussion of the link between how much one cares about the different issues and the conclusion one reaches of which country does a better job of allocating the income at hand.

For example, if one thought that there was a critical level of income so low that it interferes with the functioning of the individual as a person, but above that level, there is no reason for society to care (or care much) about the distribution of income then one can capture this in the shape of u, making it linear above the critical level, so that distribution changes that remain totally above the critical level have no effect on outcomes. This is similar to what Atkinson (1990) has called the Conservative welfare function.

Introducing labor supply into this setup, we use a two-argument utility function, relating utility to both consumpiton and work done. Adding up such utility functions gives a social objective function $S\{u(x_n, y_n)\}$, where $x_n$ and $y_n$ are consumption of person n and labor supply of person n. Now we can evaluate different patterns of how consumption varies with how hard people work. And we can see how our evaluation varies with the choice of a utility function. For example, if we want to argue that the evaluation of consumption should not depend on the distribution of work done, then we are assuming that u is additive: $u(x_n, y_n) = f(x_n)+g(y_n)$, for some functions f and g. Since one can infer ordinal properties of the individual utility functions of people from their market behavior, one can then test whether the stance that the evaluation of consumption should be independent of the amount of work done is consistent with respecting the preferences of individuals when trading off work against consumption. This then leads naturally to the discussion of when individual tradeoffs should be respected by the social evaluation and when not. Do we care, as a society, about the distribution of consumption and work or the distribution of utility?

In this setting, we could introduce additional ethical considerations such as some degree of entitlement to the fruit of one's labor. And one can introduce the economic issue that people differ in productive ability. Further one could recognize that there may be systematic differences in ordinal preferences which may be correlated with productivity. Individual preferences give an ordinal relationship among consumption and labor for given productivity (possibly revealed by market behavior), but the cardinalization of u is a social choice element (or personal ethical evaluation), unless one subscribes to an underlying measurability of the utility that philosophically one wants to add up.

## II  Income distribution and medical rationing

There is a clear parallel between considerations that are relevant when evaluating income or consumption distributions and those that are relevant when evaluating medical care allocation. At its crudest, we could make an analogy from a two-argument utility function of consumption and labor supply to a two-argument utility function of medical condition (medical need) and medical services provided.  Adding consideration of income or consumption of other goods would be a natural next step.  Let us pursue this through several steps, ignoring income distribution at first.

Health status varies with medical services, with a different function for people with different health conditions.  Using the same notation for different variables (with a ' added to remind us of the difference), we can use the simple objective function $S\{u(x'_n, y'_n)\}$. where $x'_n$ is the underlying health condition (or medical need) of person n and $y'_n$ is medical services allocated to person n.  Implicit in this formulation is the idea that there is nothing intrinsically different between medical care and income. Just as one can think about how we are willing to evaluate income gains at different income levels, so too we can think about how we are willing to evaluate the gains from additional medical services allocated to people with different health statuses.  In both cases, one can ask about the relationship between the social objective function and individual preferences, as revealed in some form of behavior.  The use of a function, u, assumes that there is a scalar description of the outcome of medical services that is a sufficient statistic for thinking about how to evaluate different allocations of those services.  The use of an additive social objective function assumes that the tradeoff between improvements for two people is independent of the health status of other people.  Just as some income concerns are based on relative incomes, as well as absolute incomes, so too one's concern about getting particular medical services may depend on the medical services other people regularly receive.  One can disagree with either of these assumptions, but the formulation makes clear the need to address these questions.  Just as the degree of curvature of u in the income setting captures how much we care about additional income at different income levels, so too the curvature of u in the medical setting captures how much we care about the improvements in medical outcomes as a function of the level of outcome of the medical intervention, given the health status.  Thus the tradeoff between helping a small number of people with large medical needs and a larger number of people with smaller needs can be discussed in a vocabulary about the curvature of the utility funciton.  One point of such a formalization is the consistency across settings encouraged by the formalism.

One difference between the two settings is that while each of them incorporates a technology, they incorporate different ones. In the case of income, we do not care about income, but the outcome from giving people resources, which in turn depends on the technology used for consuming the resources made available - home production, in the vocabulary of some. So too, the link between medical intervention and medical outcome is incorporated in the function u, along with our ethical concerns for different levels of outcomes.

It is interesting now to introduce income as another argument of the utility function. So we now write the social objective function as $S\{u(x'_n, y'_n, z_n)\}$. where $x'_n$ is the health condition of person n, $y'_n$ is medical services allocated to person n, and $z_n$ is the income level after out-of-pocket medical expenses, or, equivalently, consumption of nonmedical goods of person n. There are two different settings in which we might be considering outcomes. The simpler setting is where we are evaluating the full outcomes in medical services and incomes; the more complex setting is where we recognize that after provision of medical services, some of income might be spent on additional medical services and so medical services allocated might not equal medical services received. Let us stay with the simpler case.

One could assume that how one cares about medical outcomes is independent of the income levels of the recipients. Then we are assuming that u is additive: $u(x'_n, y'_n, z_n) = f(x'_n, y'_n)+g(z_n)$, for some functions f and g. But one need not accept the ethical justification of such additivity. For example, we might feel on fairness grounds that it is more important to give better health to poor people than to rich people. Alternatively, we could think about what people are going to do with their better health and conclude that either rich people or poor people make better use of better health. Or we might consider the ability of income to substitute for medical services in delivering outcomes in living, even when they do not deliver outcomes in better health. For example, the ability to pay for substitutes may make less important the improvement of health that would permit people to do certain things for themselves. The general formulation here serves as a setting in which to discuss alternative ways of evaluating this allocation. And income would necessarily be important if we were in the more complex setting where additional medical services might be purchased.

The addition of income to the objective function raises the same issue as in the consumption-labor example - to what extent do we want to respect the preferences of individuals (when well thought out) rather than having a social objective function that does not coincide with individual preferences? People have experience in trading off income for medical services. If people would rather have income for other purposes rather than for medical services, should these views be respected? Assuming that one wants to respect individual preferences for social evaluation,

individual preferences give us an ordinal relationship among $y'_n$ and $z_n$. As above, the cardinalization of u is a social choice (or personal ethical evaluation). We can still think how much we collectively care about different levels of outcomes that vary with both health status and income level.

This represents one way to describe a consistent approach to the issue of choosing among different medical care allocations that benefit different people with different incomes and different levels of post-medical care health. Just as the economists have developed a back-and-forth between the selection of the utility functions to be summed and the evaluation of income distributions, there is a back-and-forth between selecting utility functions to be summed and the evaluaiton of different allocations of medical care. The structure of preferences (e. g., the complementarity or substitutability between spendable income and medical care) and the cardinalization are an approach to thinking through two basic issues - the allocation of medical services to people with the same income but different medical conditions - either in terms of level of health or responsiveness to medical treatment - and the allocation of medical services to people with different income levels.

Implicit in this formulation is the idea that there is nothing intrinsically different between medical care and income - both are to be evaluated according to how society evaluates individuals with different income and health statuses, with the latter tradeoff possibly reflecting the preferences of the individuals. Economists see smooth tradeoffs everywhere. Clearly this formulation does not have room for addressing the differences in ethical claims for medical treatment after voluntary and involuntary health risks. Whether society should evaluate outcomes just as individuals do is a central philosophical question. To push this formalization into the realm of not respecting individual preferences, into the realm of evaluations based on objective, not subjective evaluations, into the realm of evaluations that do not respect the Pareto principle, we need to find an alternative source for the evaluation of individual income and medical care. For example, if one subscribes to an objectively determined minimum acceptable functioning in society, then one can use the definition of alternative combinations of income and health that satisfy this minimum as a source of evaluation.

Daniels (1985) argues that medical care is special since it relates to the basic nature of deviations from the norm of the species. This seems to apply equally well to income levels that are low relative to needs - the point then being that some medical care expense (but by no means all) are large relative to incomes and medical care is an integral part of the definition of needs. But health insurance does not fall into this special category, except for the very poor - the same group for which food and shelter are critical. Let me restate that position - recognizing differential importance in different goods seems to extend to medical services

that can not otherwise be purchased, it does not seem to extend to (mandatory?) health insurance purchase, which can be afforded by much of the population.  From this perspective the central focus of government involvement in medical care is the way that the market has trouble dealing with both medical services and health insurance, not their possibly different standing in ethical evaluation.[2]

## III  Markets and pair-wise trade

With a social objective function defined in terms of incomes, one can compare the ethical evaluation of different distributions of income.  Having made this degree of contact with philosophy (reading the literature to extract a usable, defensible simple standard), economists are then in the business of combining this objective function with a description of the determination of equilibrium in an economy as a function of some list of available policy tools.  That is, in order to bring the analysis closer to policy, one needs to describe the set of possible income distributions as a function of the policy alternatives being considered.  There is a need for a fit between the output of the model of the determination of equilibrium and the available inputs for evaluation by the social objective function; that is, the variables determined by the equilibrium model must be the arguments of the objective function.  Economists are then in a position to produce an answer to questions like how policies should change as one changes the objective function.  For example how should the progressivity of the income tax vary with the degree of concern for equality, as measured by the concavity of the evaluation of individual incomes assumed in the objective function (Atkinson, 1973).  Note that this reflects one of the prime distinctions between economists and noneconomists - a focus on the nature of equilibrium is commonly a central part of doing economic analysis.  That is, having begun by considering evaluation, not decision, the distinction being based on whether there are decisions that affect equilibrium, we will now move on to decision.

For thinking about resource allocation, the abstraction of a market is the starting place of an economist's education.  Yet this is not a good place to start discussion of the rationing of medical care.  The provision of medical care involves both demand and supply factors in an elaborate interaction.  Availability of medical services, or at least availability within the rules of what is made available at no cost or with a large subsidy plays a major role in

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2 There are obvious similarities between education as important for people and medical care as important.  There is a major difference in the immediacy of the felt need.  There is also the timing of expenses relative to earnings.  We think about mandating that people prepay medical expenses and repay education expenses.

medical services.  But even countries that rely most thoroughly on
"supply-side rationing" also use demand side rationing.  Some of it
is in the form of small cash payments for some services, services
that might be heavily overused without such charges.  Much of it
is in the form of using queuing (time prices) rather than dollar
prices to decrease demand.  And some of it is in the form of
leaving some services unsubsidized, services that are then
purchased in limited quantities, sometimes by seeking medical
services outside the central medical supply mechanism, or even
outside the country.  The presence of the US as a supplier of
medical services affects Canadian medical allocation in multiple
ways.

But it is not only in medical services that there are major
supply side effects in allocation, effects that do not flow through
prices being charged.  In an idealized market all rationing is done
by prices and incomes.  That is, it is assumed that anyone can
have as much as he or she wants of any good, provided a
willingness and ability to pay for it.  But this is an abstraction
that does not reflect how most markets actually work - markets
rife with quality differences and often asymmetric information
about those quality differences; markets where there is limited
information about the prices, availability, and even the existence
of particular commodities.  Unlike idealized markets, real trades
frequently reflect a combination of purchasing power restrictions
and individual evaluation.  While anyone spotting a flashlight in a
store can buy it at the listed price, at times of shortage, suppliers
often select who can purchase, locating the available supply out of
sight.  And the labor market regularly works with this
combination of price and individual evaluation.  My willingness to
work for a lot less (zero, perhaps) does not open up for me a
position on the Red Sox pitching staff or on the Council of
Economic Advisers.  Nor do I have an ethical claim to these
positions (Weinreb, 1984).  Commonly, there are multiple
applicants for jobs, with the employer selecting one (or none) from
among the applicants.  Thus it is not only in "noneconomic"
settings - friends, dates, marriage - that individual proposals or
propositions are simply rejected rather than offered at different
prices.

It is precisely the tension between the insurance need for low
prices and the excessive demand effect of low prices that makes
direct restrictions appealing as an integral part of health
insurance.  The restriction that the medical provider should only
do what is medically appropriate is a form of rationing, one that
is limited insofar as people have the opportunity to shop among
various providers (with possibly different definitions of medically
appropriate) with a subsidized price.  But this raises the central
issue of the determination of medically appropriate, and
particularly the role of limited supply of services in affecting
perceived definitions of medically appropriate by medical
providers.  Further linked here is the problem of determining the
equilibrium levels of medical supply.  If one uses only demand

side controls and allows resource supply to respond to demand, there is not a separate decision about the level of resources to use in medical care. Where there are limits on supply availability, then one needs a basis for selecting the level of supply to make available (or the incentives that directly affect that level). Thus one needs a model of how the aggregate supply limitations affect what medical care is provided. Without such a model it is hard to evaluate alternative levels of supply. My focus here will be on modelling the implications of such supply-side oriented rationing. The issues of the ethical and political implications of arranging for and communicating about the rationing is also fascinating, but lies outside the issues I will discuss here.

One way to proceed would be to reverse the medical supply assumption of perfectly elastic availability to one of perfectly inelastic supply (at the individual supplier level). For simplicity, the role of demand side restrictions is totally eliminated, assuming that medical care is provided at no cost when the patient and the provider are both willing. In other words, any level of aggregate supply will map into different uses of that aggregate supply as different mechanisms are used to fit resource use under that supply. In particular an approach that explicitly puts down rules at a higher level (such as the Oregon approach) will have different outcomes from a system where the decisions to fit within resource availability is being done at the level of the individual hospital and provider. (One should not exaggerate the difference, since conditions can be differently labeled and the implementation of a rationing policy set at a higher level will have some of the characteristics of rationing done at a lower level.) One needs a model of the decisions at the lower level, a decision process that will be influenced by the behavior of other providers and so needs an equilibrium analysis

It is one thing to lay out the ethical principles that should govern the allocation of given medical resources to a given set of patients. It is a more difficult task to evaluate the outcomes given a process of rationing. If the same ethical rules are given to all medical providers, what is the outcome in a world where there are many providers and patients choose among different providers? To evaluate equilibrium outcomes, one needs a theory linking the rules followed by providers and patients and the outcomes. The providers may not exactly follow the rules laid down. Even if they do, the equilibrium will not generally resemble the outcome for a single provider. I now sketch a version of a simple theory of such equilibrium, which can be skipped without loss of continuity. The point here is to identify for economists an example of what needs to be done in order to describe equilibrium in a multiple provider supply-side rationing setting. I will use search theory for this example, although queuing theory is a better starting place for some medical allocation issues, e. g., hospitalization as opposed to outpatient services.

One could readily adapt search theory for this purpose (see, e. g., Diamond, 1987). Assume that there are demanders and

suppliers of medical services who meet pairwise.  (Realistically allowing medical suppliers to have multiple patients would complicate the setup here, but should be basically similar.)  On meeting a potential patient, the provider perceives a gain from beginning the supply of medical services to this particular patient. The relationship generates a flow of gain and can end as a result of recovery.  Critical to the analysis is a model of how the provider perceives the gain from providing services to a particular patient.  Different providers will have different value judgments about the social worth of accomplishing different medical outcomes.  Different provisions may have different financial implications for the provider personally or for the system.  For example, we know that in some countries with serious shortages of supply, bribery of providers is widespread.  This is a different form of reliance on the market and presumably not what a supply-constrained system is supposed to accomplish.  One also needs to model the alternative to beginning medical services - for some patients and providers it is to continue searching for an alternative patient and an alternative provider.  For some patients the alternative is a lack of medical services altogether.

This symmetric modelling of patients and providers does not fit perfectly here, nor does it fit perfectly with labor and housing markets where it has been applied.  When there is a significant pool of available people on one side of the market as well as a flow of new arrivals, the problem is more complex.  Doctors often have a backlog of patients available for a procedure; home buyers who have searched the market are a pool waiting to examine houses newly put on the market; firms often have a backlog of job applications available when a vacancy develops.  But I will stick with the simpler model since it brings out two elements that are part of the determination of resource allocation in such a rationing environment.  Patients do shop for alternative medical providers when there is limited availability (and also when there isn't - more a matching issue than a rationing issue).  Providers must have an objective function when deciding to which of the actual (or potential) patients to provide particular services.  From search theory, a doctor maximizing the present discounted value of the gain from providing medical care would pick and choose among patients, depending on the condition of the patient, the quality of the "match" between the patient's problem and the supplier's skill and the financial and utility implications, if any, associated with selecting one patient rather than another.  The problem of modelling who gets rationed in this setting is the problem of determining search intensity for different patients who are trying to locate medical services and of determining the endogenous rules followed by providers in deciding which patients to accept.  This "shadow value" is endogenously determined, reflecting among other things the availability of medical supply relative to demand and the degree of specialization of the supplier.

There are a host of questions one must face before reaching a description of equilibrium resource allocation, which can then be

evaluated. One of the central ones is how providers perceive the "gain" from treating one patient rather than another. This can be influenced by government and the medical community in a variety of ways. One might gain from thinking about the labor market parallels. We apply various nondiscrimination rules to hiring decisions. We sometimes subsidize some employment decisions (e. g., taking someone from welfare). We sometimes use local preference rules to encourage employment of some people over others. Despite the importance of employment to a long list of personal issues, we do not intervene in much detail. Health care calls for more intervention because we are concerned over the implications of as much reliance on price mechanisms in allocation as we do use in labor markets.

Daniels (this issue) discusses his study of how provider organizations make decisions on which services to provide. His focus is on the process, the procedure being used. This follows the familiar practice in legal analysis of focusing on process when one is not in a position to evaluate outcomes or when one cares about both process and outcome. But surely one also cares about outcomes and not just process. It will be difficult to extend the analysis to an informative discussion of the efficiency of outcomes, but that is needed if the philosophical discussion is to fit into a complete analysis.

There are two issues here that it is well to identify. One is how we should enforce contracts that involve aspects that the signers of the contract (at least the patients if not the providers) did not consider. This fits into the realm of the ethics of reaction to surprises, where consideration includes concern for expectations and payments based on those expectations. The second issue is what sort of contracts should be allowed, given how they will be interpreted. The regulation of contracts is medical rationing, even if people have the freedom to choose among different suppliers, and perhaps different contracts.[3] And that leads to a central issue, of whether the contract should be totally standardized, or in a different vocabulary, whether there should be two-tier medicine, or the same medicine for everyone. I find that it takes a string of assumptions all with difficulties, to reach the conclusion that everyone should receive the same medical care contract or promise.

I list a few examples of combinations of assumptions that result in potential advantages for nonuniform provision of medical services. Plausibly, people have different preferences between medical services and other goods, resulting in a case for different medical services if it is deemed appropriate to respect individual preferences, even if incomes have been equalized.

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3 This discussion brings to mind the legal discussion about standard form contracts (adhesion contracts) offered to individual buyers on a take-it-or-leave-it basis (Katz, forthcoming, Kessler, 1943), which might be a fruitful source of analogies.

Alternatively, even if individual preferences are not respected, the social evaluation of outcomes in terms of consumption, work and medical services might not be additive in medical services. With a case for different people working different amounts, there is a case for providing different people different medical services if there isn't additivity in the social objective function. Alternatively, problems of asymmetric information may result in an unequal distribution of income as the best achievable income distribution; the same considerations that yield inequality in incomes as part of this optimization will generally yield inequality in medical services. These examples have been based on the interactions among medical services, consumption, and work, interactions that seem plausible to me, with or without asymmetric information. Within the provision of medical services, different people may approach available medical services differently, making for an advantage in giving them different choices. These examples all lie in the methodology of writing down a formal objective function and considering alternative allocation mechanisms and their constraints. Issues of political economy (and the impact of ethical ideas on political outcomes) is an alternative route to consider.


IV  Optimal taxation

Supply-side rationing requires consideration of the pairwise matching of patients and providers. In contrast, demand side rationing can be thought about in terms of a market setting - with demand for services without specific identification of providers. For the income distribution question, the optimal tax literature (Tuomala, 1990) is one approach to doing this and we explore some parallels here. In the optimal tax literature, excise taxes, income taxes, and government spending rules are control variables for the maximization of an objective function defined in terms of individual utility, with a description of the determination of equilibrium in the economy as a constraint on what the government can do. The bulk of the literature assumes competitive markets (and a complete set of them at that) and I will use such a formulation here.[4]

To have a concrete example in mind, let us consider the standard model of optimal linear income taxation. There are two goods, consumption, denoted x, and labor supply, denoted y. People differ in both skill and preferences, with the index n being both the productivity of worker n and an index of preferences. Nonlabor income is not separately recognized in the model, making it unavailable for taxation. There is a distribution of the index, n, in the economy. The government is assumed to be constrained to taxing labor income only and further constrained to

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4 While tax analyses are commonly done in market settings, they have been extended to ones where resource allocation is dependent on search for trading partners, as above.

the use of linear taxes - a proportional payroll tax and a lump
sum amount, the same for everyone, which could be a tax or a
transfer, but is assumed at the optimum to be a transfer, since
there are sufficiently poor people that transfers are part of the
optimum.  When tax parameters are a (for the transfer) and b (for
the tax rate), individual choice is the maximization of utility.
Thus the choice of x(n) and y(n) satisfy

(1)   Max u(x, y, n)   subject to: x = a + (1-b)ny.

Given these behavioral responses, we can write the social
optimization as maximizing the sum of (cardinalized) utilities,
subject to the resource constraint (or, equivalently, the
government's budget balance):

(2)   Max S{u[x(n), y(n), n]}   subject to S{x(n)} = S{ny(n)}.

Solving this optimal tax problem gives the relationship between
optimal tax and transfer rates and characteristics of both the
economy and the objective function - e. g., the relationship of the
tax and transfer rates to the degree of inequality aversion (as
measured by the curvature of the utility function), to the degree
of inequality (as measured by the distribution of the productivity
index in the economy) and to the responses of labor supply to
taxes and transfers.  The formulation increases our understanding
of the importance of estimates of the elasticity of labor supply in
the debate on tax policy among people who accept the same
underlying formulation of the policy problem.  Similarly, the
formulation, if shared, helps identify the degree of disagreement
about tax policy that is appropriate given the degree of
disagreement on how much we should care about income
inequality, as measured by the curvature of the function u.
Similarly, we can consider having the social objective function not
respect individual preferences, so that, the u in equation (1) might
be different from the function used in equation (2). Then, the
formulation would relate the disagreement on tax policy to the
disagreement about the objective function, with both sides
agreeing (subject to the range of empirical disagreement) as to the
behavioral constraints on what can be accomplished by tax policy.
It is only with shared underlying conceptions that one can sharpen
the nature of ethical disagreements as well as the implications of
the disagreements.

    This optimal income tax problem is an example of what
economists call second-best analysis.  This involves optimizing the
use of some policy tools in a setting where other tools, if
available, would permit a better outcome.  In the income setting,
lump-sum redistributions of income are assumed not to be
available, so that one is using "distorting" taxes, taxes that
interfere with the efficiency of the economy, as the best available
tool for improving income distribution.  In a setting like this one
can not separate efficiency from equity considerations, they are
thoroughly intertwined.

## V  Optimal taxation and medical rationing

Some countries use prices to influence the demand for medical services.  Whether this is a deductible and coinsurance system looking to overall spending or a flat charge per visit to an HMO, such financing by prices has two roles.  One role is to raise money - to generate resources to pay for medical services.  The second role is to affect behavior - to affect the frequency of visits to a doctor, possibly the choice of doctor to visit, and sometimes, in discussion with a doctor, the medical services received.  In order to evaluate the use of such pricing at all or the choice among different pricing schemes, one needs an equilibrium model where the outcomes depend on the prices that patients face.  The model will have two components.  One is the behavior of patients in response to prices and the second is the behavior of providers in response to prices and other resource constraints.  In this section we consider a model where there are no other resource constraints - doctors just provide the level of medical services demanded, given the health condition of the patients and the pricing the patients are facing.  I assume no provider response to provider reimbursement rules, which are assumed to be independent of the insurance rules of the individual patient.

In the optimal tax model presented above, all rationing is by a combination of market forces and tax policy - individuals are assumed to have all the consumption that they can afford given market prices.  This is clearly a limited model of the workings of the economy in general, and certainly of the allocation of medical care.  But it is a start; it would be more complex to consider demand side rationing in a model where there is also supply side rationing.  So let us consider similar problems for the use of demand side rationing controls.  Below, I will consider supply side controls.

Let us assume that the government provides the same health insurance policy to everyone and that it is a two parameter insurance policy - a deductible a and a coinsurance rate b.  That is, we assume that individuals pay all of medical expenses until the level a, and then pay a fraction, b, of remaining medical expenses.  To begin, let us assume that income is given - there are no labor supply decisions.  The government must also choose a financing rule for the level of medical services that are supplied in equilibrium.  Calabresi and Bobbitt (1978) talk of two steps in resource allocation (first and second order determination) - how much to make available in aggregate and how to allocate that among individuals.  But any resources made available for medical services are not available for other uses.  Thus there is another question - who gives up the needed resources in order to have the level of medical services that are made available.  Moreover, paying attention to this link keeps before us two issues.  If the ethical evaluation of the allocation of medical services has an

interaction of health outcomes with income levels (as would
certainly be the case if people were free to purchase additional
medical services), then who pays for medical services is relevant
to evaluating who gets them.  In addition, some ethical criteria
recognize entitlements to resource already possessed; that is, they
distinguish among final allocations based on how those allocations
are achieved.  For such criteria it is ethically inappropriate to
separate the evaluation of the receipt of medical services from the
paying for medical services.  For example, if I am willing to
donate a kidney to my brother, but not to anyone else, my brother
may have a stronger claim to my kidney than anyone else does,
once it has been removed from me.  One might have an ethical
evaluation where the distribution of payments did not matter, but
such a restriction needs to be argued for explicitly.

Thus I do not separate the allocation of medical services from
the acquisition of the resources need to finance their supply.  For
example, consider the ethical evaluation of preventing people from
purchasing additional medical services beyond those provided to
them in the allocation to be evaluated.  Such a ban might or might
not have direct ethical elements, depending on one's criteria.  The
influence of payment for medical services on medical outcomes is
different with and without such a ban.  Thus consideration of
policy decisions, as opposed to just evaluation of outcomes, needs
to consider financing simultaneously with allocation; and even
evaluation needs to consider this under some ethical approaches.

The simplest way to model the determination of equilibrium is
to allow individuals to choose how much medical care to purchase,
subject to its availability in competitive markets.  Thus chosen
medical care depends on income (taken as given), net of taxes
(which cover, in aggregate, the cost of insurance), and health
status, indexed by n, as well as the parameters of the health
insurance policy, the deductible a and the coinsurance rate, b.  We
can write this as $Y(I-T, n, a ,b)$.  That is, the use of medical
services depends on the income net of taxes of the individual
(again the role of financing of medical services on the use of
medical services), the health status of the individual (represented
by an index) and the parameters of the insurance policy, taken
here to be deductible and coinsurance, but interpretable in terms
of other pricing structures.  One of the key elements is which sorts
of medical demands are affected by the pricing rules, an element
that fits awkwardly into a static model, one without a time
structure of what decisions are made when.  The role of doctors in
the determination of medical resource use is through their
influence on patients in the patients' perceptions of their
preferences.  That is, the doctors are assumed to behave as perfect
agents of the patients.  Deviations from this assumption to reflect
either overall resource limitations and higher priorities or the
personal advantage of doctors would extend the model.  But one
needs to start with simpler models first.  The medical service
demand function, Y, comes from maximizing the utility of
consumption, x, and medical services, y, subject to a budget
constraint (and incorporating the medical advice of providers):

(3)   Max u(x, y, n) subject to x = I-T - Min{y, a+b(y-a)}.

The budget constraint has consumption equal to net-of-tax income, less out-of-pocket medical expenses.  Out-of-pocket medical expenses equal total medical expenses, if these are less than deductible, or the deductible plus the fraction b of the excess of medical expenses over the deductible.  Whether or not the social evaluation respects individual preferences, behavior must be described in terms of individual preferences, which economists generally take to be this maximization.  Given this demand function for medical services and the financing rule, we can state a social optimization problem.  There are a variety of financing mechanisms that one can consider.  The simplest relates taxes to income according to an arbitrarily given tax structure, up to a scale parameter adjusted to raise the needed level of revenue.  Rather than the tax structure being given, up to a single parameter, the aggregate revenue needed, we could consider the simultaneous optimization of the health insurance parameters and the income tax parameters and their interaction.  But I will stick with the simpler problem.

Let us denote by R the government's revenue needs for financing the equilibrium amount of medical services.  Thus R is the sum of medical expenses less individually-paid out-of-pocket medical expenses, plus overhead costs.  We denote by T(I, R) the taxes paid by someone with income I when total revenue needs are R: the sum of these taxes over the population is equal to R.  Using the medical demand function Y, we can state the social objective function as

(4)   Max S{u(I - T(I,R) - Min{Y, a+b(Y-a)}, Y, n)}
          subject to R = S{Y - Min{Y, a+b(Y-a)}}
                        = S{Max{(1-b)(Y-a), 0}}
          where Y = Y[I-T(I, R), n, a ,b].

Implicitly, I am assuming that the cost per unit of medical services does not vary with overall use, an easily generalized assumption.  We could now obtain the first order conditions for the choice of insurance parameters, a and b.  These would reflect health insurance elements - the responsiveness of medical services demanded as a function of deductible and coinsurance - as well as the interaction of medical expenses with income distribution and pure financing elements.  This formal equilibrium structure would make clear that what isn't paid for directly is paid for indirectly through taxes.  And it would emphasize that there are income distribution issues in taxes as well as income distribution issues in direct payments for medical services.  One could analyze this problem to identify the empirical and ethical values that are important for determination of optimal policies.  Thus the interaction between income and health implicit in the objective function will play a role in the outcomes.  Similarly, the particular cardinalization of the utility function would have an

effect on the pricing mechanism one would want. And one could consider whether or not to have the social objective function respect individual preferences between income and medical services. That is, one could evaluate outcomes in a way that was not consistent with individual preferences and still find pricing useful in the allocation of resources. In this case the maximization that gave rise to the demand for medical services, Y, would not necessarily coincide with the social evaluation of outcomes, u. If they did not coincide, we would need different notation to distinguish them.

As set up, the interaction of medical services and the rest of the economy comes through its direct impact on income distribution (and therefore indirect impact on medical services purchased). But medical services are expensive and the impact of financing on the efficiency of the economy is a factor in the discussion of government organized health insurance. While adding considerably to the complexity, the model just described could be generalized from a given distribution of income to a distribution of skills, with distorting taxation a necessary part of both financing medical care and any direct redistribution happening in the economy.

In the standard optimal tax problem, if it is feasible and ethical to perfectly separate the population into groups for the purpose of subjecting the groups to different tax regimes, then such a separation can not worsen the result of the optimization and will generally help. Imperfect separation can be a significant improvement as well, provided the imperfections (and associated incentives) are not too large. Age is the obvious candidate for such a separation since it is easy to track accurately in an advanced economy and correlates with systematic differences in consumption and labor supply behavior. This logic extends to health insurance as well. A national health insurance that had different deductibles and coinsurance rates for different ages would be a natural expansion of regulatory parameters, one that has the potential to increase social welfare.

While this presentation has focused on deductibles and coinsurance, one could formally present a similar analysis for extent of coverage. This would involve labelling people (with error) for the medical condition they are in, with coverage rules varying with condition. Limitation of coverage does not eliminate the role of pricing rules.


VI  Choice of insurance regime

Economists have found it very fruitful to approach problems within the framework of asymmetric information. In the model of optimal tax above, individuals know their skills, but the tax authorities can only measure earned income, not skills. In the model of medical provision above, individuals know their medical

needs (possibly after medical consultation), but the insurance authorities can only measure medical expenditures, not needs. These are both examples of asymmetric information. The economics literature has recognized that in the presence of asymmetric information, there is value to additional complexity in the interaction between the designer of incentives and the responder to incentives. For example, there has been analysis of the setting where the government selects not just a single tax structure, but a set of tax structures, letting people choose at the start of the year which tax structure they want to be under for that year. If there were no uncertainty, this would just be a way of characterizing the nonlinear income tax problem. Once we introduce uncertainty then using a set of tax structures and individual choice is a way of achieving a higher level of the objective function, since the additional degrees of freedom in setting incentives has real payoff.

One could do the same with health insurance. The government might have a set of different insurance policies (or income-dependent insurance policies), letting individuals choose at the start of the year which policy will govern them during the year. As long as this is being done in a coordinated single optimization, the intertemporal adverse selection problems are just part of the optimization, limiting the value of such diversity, but not removing it. One could approach a world of regulated private provision of insurance in this way, but there would be additional issues of adverse selection, since the workings of some medical rationing schemes are strongly influenced by adverse selection issues. The difference between public provision and regulation of private offerings is in the possibilities of cross-subsidization ('risk adjustment' in the vocabulary of health insurance). The need for risk adjustment and the severe limitations on our ability to do it well are major topics for the design of systems which either use risk adjustment or are justified because they avoid the need for risk adjustment. (On organizing the health insurance market, see Diamond, 1982.)

In giving a choice of tax or insurance regime to individuals, we are trying to use self-selection to offset some of the limitations coming from asymmetric information between individuals and government. We can also approach the costs of asymmetric information by using a differently structured design for the insurance system. In the tax setting, Stern (1982) has compared optima when the government chooses between two different instruments. One is a linear redistributive tax, like that discussed above. The other is a lump-sum transfer system from low productivity to high productivity workers, but subject to errors in identification of worker types. These two approaches are similar to the two different systems of reimbursing hospitals - systems that pay a fixed amount for each diagnosis (diagnostic related group or DRG systems) preserve incentives to optimize costs, but involve the risk of misclassification and so incorrect reimbursements (together with any effect this has on medical

provision). In contrast, a regime of cost sharing between insurer and provider has a different incentive structure. Combining these approaches may have possibilities worth the administrative complexity.

One could also approach a formalization of the Oregon approach in this way. Each person would be characterized by a true health condition and a health condition as perceived by the insurance authorities. The definition of health condition would include the implications of alternative medical interventions. Then the design of coverage becomes a selection of what to do in a setting of stochastic evaluation.

VII   Social security and paternalism

The discussion above had no explicit time dimension. It is natural to think of applying it to each year on its own terms. But that puts a lot of weight on the relative treatment of the utility functions of people of different ages. Daniels (1988) has argued for a life-cycle perspective for deriving this structure. In making this argument he has also stressed the need for recognition of possible imperfections in perceptions of people at one time of their medical needs when older, and in parallel, when sicker. This stance of questioning consumer sovereignty (sometimes in the vocabulary of multiple selves) is a familiar part of the discussion of social security or mandatory savings plans. This suggests that just as mandatory savings for retirement is a natural response to this perceived problem, so too implicit savings in the form of insurance premiums that do not vary with age as much as underlying costs is an appropriate part of health insurance policy.

This concern for valuing income at different ages extends to coverage issues as well. An individual's perceived tradeoff between medical care and other income at some age can be seen differently from different vantage points. This is particularly an issue when benefit elements are somewhat separated from payments, as is the case with payroll tax financed health insurance benefits or with age smoothing in premiums. One can do age smoothing on a break-even basis, in present discounted value terms, for a cohort. That is, in principle, one can separate the age structures of premiums and coverage rules from intergeneration redistribution. In practice, this is generally not done. Rather benefits are provided to older people when the system is started. This has a similar fiscal character as with the start of defined benefit pension programs - involving a great deal of intergenerational redistribution. Insofar as the rationing of medical care is linked to who pays for the services (in practice or in ethical evaluation), then the intertemporal and intergenerational aspects of who pays for medical care is an essential part of considering the rationing of medical care.

To be concrete, let us consider Medicare. There is a natural separation between the premium and coverage sides of the rules

for Medicare.   The premium side closely parallels issues in Social Security, as it should since medical expenses are a major expense for the elderly.   There is a natural division of the premium issue into three parts.   Should some part of the premium paid by the individual be collected when the individual is working, rather than collecting all of it when he or she is retired?   How should intragenerational redistribution be done?   How should intergenerational redistribution be done?

As discussed in the next section, insurance market shortcomings are a further reason for social insurance programs. But the predictable (or relatively predictable) age dependent structure of medical costs[5] (averaged over an entire cohort) is not a basis for an argument sounding in insurance market failure.[6] Mandating that people prepay their medical expenses is part and parcel of mandating that people prepay retirement annuities.   A mandate can overcome inadequate savings for future needs; prepayment provides insurance against the risk in the premium one would be charged if there were premium variation with health and life expectancy if arrangements waited until an older age was reached.   In terms of Daniels's approach, if we do not want to rely solely on the perceptions of the young when deciding about the medical coverage for them when they are older, we also do not want to rely solely on their perceptions when deciding how to pay for the medical care.

Similarly, using an earnings-varying basis for premiums is part of a redistribution pattern.   In terms of the model employed above, the uniform medical benefit (relative to income) being financed by the distorting payroll tax applies to health insurance premiums as well as cash benefits.   In a model where there is no variation of premiums with health condition, there is no distinction between providing health insurance and providing more income and mandating the purchase of health insurance. Where there is a difference is in the responsiveness to social risk. The cost of medical care in the distant future is unpredictable.   A social insurance institution (which can always be changed after all) is a base line from which the political response to the realization of the actual costs comes.   The division of this risk between young workers (through payroll taxes) and older retirees (through benefit cutbacks and any premium portion they pay) is a fit subject for optimal risk-sharing analysis.

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5 The age structure of expenditures is endogenous, but there is an age structure to medical needs, which will impact on the age structure of expenditures as a function of the organization of medical services.
6 Actually this is not quite right, but opens up the separate issue of uncertainty about future aggregate medical expenses (not just individual expense conditional on the aggregate) and the bearing of the risk (and return) from variation in desired expenditures (or the opportunity for expenditures) as both costs and medical opportunities develop in an unpredictable way.

Similarly, the overlapping generations nature of this program represents an opportunity for intergenerational risk sharing that is not present in markets. This is also a redistributional mechanism where different generations have different (anticipated and realized) income, medical supply, and utility levels. There is a particular issue around the startup of a new social insurance program. If there is an efficiency gain from the introduction of a new program, then that should be shared with the current older generations (whether already retired or nearing retirement). That does not necessarily mean the provision of full steady state benefits, or the even more common pattern in retirement income of being even more generous to the early generations (than the steady state benefit formula) by using a common benefit formula but a reduced averaging period for determining benefits.[7] But it seems nonoptimal to exclude older generations from more efficient social insurance mechanisms. It also seems a political nonstarter. Could one imagine starting up a long-term care social insurance program that only applies to the current young when they become old? Intrafamily provision of resources to the elderly further complicates a simple position on this issue.

VIII   Social security and insurance markets

In addition to recognizing paternalism as a basis for compulsory insurance, the social security literature recognizes adverse selection problems in insurance markets, the limitations of long-term contracts in insurance markets, and the typically lower costs of well-run social insurance programs. All of these apply to health insurance as well as annuity markets, indeed they are stronger in this context. In both settings, these concerns do not distinguish between public provision and mandated, regulated and coordinated private provision. But the issue is important for system design in either setting.

In both health insurance and annuity provision, information about the risk characteristics of individuals becomes available as time passes. Individuals have trouble insuring today for the risk classification in which they will be placed tomorrow. Long-term insurance contracts are problematic on both demand and supply sides - we have questioned the decisionmaking of individuals on the demand side and the risks associated with supply also evolve. The complexity in evaluating the quality of provision makes long-term contracts for medical care difficult. The quality issue is made even more difficult by the rapid technological development in the provision of medical care. Indeed the host of issues around the development of medical technology have been omitted in my discussion. So economists have recognized the tradeoff between providing insurance against classification risk and the induced

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7 This characterizes the much later Canadian system as well as US experience.

inefficiencies in later decisions as the price of insurance is not set right for individual decisions. This is a repeat of the basic health insurance tradeoff - subsidizing the cost of medical care to provide insurance at the expense of having poor incentives for use.

The perspective of insurance market failure raises a central issue. Do we think about medical services differently from other goods because of intrinsic underlying differences, or do we think of medical services differently from other goods because the insurance market failures make it important to treat them differently? The link between concern about medical services and insurance market shortcomings is further strengthened if we recognize the time inconsistency of individual preferences. That I do not plan now my purchase of baseball tickets in the future, when I may or may not feel the same about baseball as I do now seems of little consequence. But if I do not arrange now to be able to afford the medical services that I may greatly desire in the future because I am not forward looking enough - that seems more important precisely because the scale of expenditure is so large relative to income as well as being uncertain, without requiring something special to do with medical services. If medical services were inexpensive, we would let people buy whatever they do and not worry about rationing. From this perspective, medical services are in the category of large risks inadequately faced. Similarly, we want to rescue people from some of the consequences of natural disasters that they had no way to anticipate. The problem with federal disaster relief comes when the residents of disaster prone areas expect to be rescued even though the risks are recognized and the insurance is available to purchase. Is medical care in the same category? Perhaps the intensity of concern when a life is a stake is a major complicating issue, one that involves medical care and rescue, and is not only an increase in the magnitude of issues raised in other contexts.

Like many ethical questions, the timing of decisionmaking plays a major role in how we perceive and describe the alternatives. Indeed this is the point of the veil of ignorance, and the limitations of application of analyses that come from considerations behind that veil. Consider a group of people with some medical services available and ask how to allocate the services equitably. The focus is on need for medical services and fairness in allocation, with fairness naturally defined as equal access, conditioned on need. Consider the question of allowing trade of medical services for other incomes after this allocation among the people. While we are naturally appalled at selling body parts, are we equally appalled at selling access to some medical services, which, like most medical services, have little or nothing to do with life expectancy? What if we take a step back in time and consider people deciding how much each will contribute to having medical services available for them collectively? Assume that they are all of equal income, and similar health prospects but vary in how much some health outcome differences matter to

them.  I really care about my ability  to play tennis - you really
care about vision, etc.  Is there something ethically wrong in
allowing different people to contract for different amounts of
medical coverage.  Having made such a contract, does evaluation
at a later moment of time make it unethical to consider who paid
for the services that are available.  How much does the story
change when something happens that was not anticipated when
the original contract was made?


IX  Regulating health and safety risks

        In addition to providing medical services to improve the
health and well-being of the population, we regulate risks to
health and safety.  And we do not regulate many behaviors that
have important effects on health.  This raises two issues - can we
learn from the safety regulations anything useful for the
discussion of rationing medical care.  After all, not requiring
people to do more to avoid health and safety risks is akin to
rationing medical service - it increases the health problems of the
population.  (For example, requiring everyone to drive no more
than 10 miles an hour in residential neighborhoods would decrease
accidents to children.)  If everyone is entitled to the same medical
services, does consistency then require that everyone have the
same access to safety, which affects the need for medical services?
How does this relate to the large (and growing) differences in
mortality by income and education?  Second, we can ask to what
extent the problems of medical care and safety risks are different,
so that the solutions should be different.  This relates to the
familiar distinction between statistical and actual lives - the
contrast in expenditures between prevention and rescue.  Some
critics think that we overspend on rescue.  Some critics lament the
lack of consistency across different risks (Breyer, 1993).  Medical
care has both features suggesting parallel analyses of why this
happens currently and how we might arrange things differently if
we wanted to.


X  Concluding remarks

        Economics is wedded to the use of mathematics in the process
of describing the allocation of resources.  This calls for a
mathematical formulation of the description of objective
functions for the overall allocation.  This mathematical process is
a source of a back and forth with philosophy as philosophical
insights are described in usable mathematical terms, sometimes
illuminating some of the content and implications of these
insights.  Moreover the patterns of consistency that lie in formal
functions impose patterns of implications of philosophical
statements that may also be helpful.  The recognition of
individual responses that partially determine the allocation helps
identify both empirical and philosophical questions that warrant
being addressed.  Thus the next step in pushing research along the

lines of the parallels drawn out here is to have models that formally determine medical allocation, reflecting processes that determine who gets what, and how much is involved in total, and combining that with formalizations of the different criteria of evaluation that have been put forth in the philosophical literature. This has the makings of a fruitful engagement.

The allocation of medical services and the financing of them is a complex issue. I have supported the common approach of economists: to analyze in detail specific simple versions of parts of the relevant issues. This is following a long-standing tradition in economics, one described well by Marshall (1948):

> The element of time is a chief cause of those difficulties in economic investigations which make it necessary for man with his limited powers to go step by step; breaking up a complex question, studying one bit at a time, and at last combining his partial solutions into a more or less complete solution of the whole riddle. ... The more the issue is thus narrowed, the more exactly can it be handled: but also the less closely does it correspond to real life. Each exact and firm handling of a narrow issue, however, helps towards treating broader issues, in which that narrow issue is contained, more exactly than would otherwise have been possible. With each step ... exact discussions can be made less abstract, realistic discussions can be made less inexact than was possible at an earlier stage. [1948, page 366.]

It is not easy to have a back and forth between disciplines that have developed different vocabularies, different styles of analysis and discussion. Yet such dialogues have great potential, not when held in the abstract, but when held on specific topics of real interest to both disciplines. Rationing medical care is such a topic.

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